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ROBERT STANLEY BREED, 1877 to 1956

Dr. Robert Stanley Breed died suddenly on 10th February, 1956, at his home in Geneva, New York, U.S.A., at the age of seventy-eight.

This bare announcement, without any elaboration, will evoke a responsive regret in bacteriologists of all ages and in every field of bacteriological study; for very few can have equalled his diversified and voluminous correspondence and extensive personal contacts with those interested in nomenclature, classification and identification of bacteria. In his discussions with individuals or groups he evinced an attentive interest in every opinion, with an alertness for significant detail, and he introduced a personal element in his letters which made them more than an enquiry or persuasive argument, so that a tolerance and a sense of friendship was engendered in these relations, notwithstanding that the subject might involve disagreement.

A less personal but far larger number are aware of R.S. Breed as the Editor-in-Chief of Bergey's Manual of Determinative Bacteriology. His name appears as a member of the Committee responsible for the First Edition of the Manual in 1923, and he took principal charge of it on the death of Dr. D.H. Bergey in 1938, to devote his entire time and restless interest to the development of the book from 1947 to the very day of his death. Few appreciate and only Robert Breed really knew the tremendous labour that went into bringing out a new edition of Bergey's Manual, and, with the deposit of almost the entire manuscript for the VII Edition with the publishers, he was happily within sight of the culmination of eight years of unremitting constructive work. It is sad that he did not live the little longer to have the satisfaction of seeing the VII Edition in print. Breed took great pride in the enlarged international character of the Manual by the cooperation of contributors from many countries, and was ever anxious to find anyone with authoritative knowledge willing to elucidate the intricacies of differentiation and relationship of the organisms treated in any section of the Manual.

Dr. Breed had a stupendous memory for detail which seemed no whit impaired as the years passed, with a capacity for finding references to obscure and significant observations, and he possessed a vast store of coordinated information and experience. He was characteristically tenacious of an opinion he had founded on enquiry and comparison and was seldom persuaded to relinquish an idea that fitted his purpose. His sincere design was the constructive development of the nomenclature and classification of bacteria, and that he occasionally defied a rule or indulged a predilection does not detract seriously from the recognition due to him for the many and great improvements in Bergey's Manual since the Fourth Edition and for the tremendous influence the book has exercised.

Dr. Breed's claim to fame does not rest entirely with the contribution he has made through Bergey's Manual and numerous papers dealing with systematic bacteriology, as well as a long period (1930-1952) as one of the Permanent Secretaries of the International Committee on Bacteriological Nomenclature. His researches and his work with the American Public Health Association and the Milk Industry Foundation, earned for him a distinguished place in dairy bacteriology and a large share in the standardization of official methods for the examination of dairy products. His work in this field brought him the appointment as Head of the Division of Bacteriology in the New York State Agriculture Experiment Station in 1913, from which he retired in 1947 with the title of Emeritus Professor of Bacteriology in Cornell University.

Dr. Breed was born in Brooklyn, Pennsylvania, U.S.A., on the 17th October, 1877, and took his B.A. degree at Amherst College in 1898, his M.S. degree from the University of Colorado in 1899, and his Ph.D. degree from Harvard University in 1902. He studied further at the University of Göttingen and the University of Keil in Germany, and the Institut Pasteur in Paris; he taught for eleven years as Professor of Biology at Allegheny College. He was President of the Society of American Bacteriologists in 1927. He received public recognition from the city of Geneva, N.Y., for a long period of service to the community as a City Health Commissioner, in the Geneva Historical Society, in Rotary, and in other social services.

To lead so full a life must needs depend on strength of character with which there must be associated emphatic

opinions and of them such that all cannot subscribe to; these Breed had but withal he had sincerity and kindly encouragement to offer, curiously combining gentleness and obstinacy, and, since he did not spare himself incessant work, he gave generously to all out of his knowledge and experience. Long after any of his multitude of friends remain to speak of having known him, the mark he has left on systematic bacteriology will remain to his memory, both in the outward form of his own achievement and less tangibly in the interest he imparted to others. But even did he thus incite in others a fraction of that necessary one per cent of inspiration, to provoke the essential ninety-nine per cent of perspiration, he must have possessed a discerning genius; perhaps this was Robert Breed's greatest quality.

E.G.D. Murray

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A NEW SALMONELLA SEROTYPE, SALMONELLA BURY (4, 27, 12 : c - z_6) OF HUMAN ORIGIN

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A baby girl aged two years entered Booth Hall Hospital in February, 1953, suffering from an acute respiratory infection, and with a history of having had mild diarrhoea for three days prior to admission. The temperature, which had been 100°F on admission, returned to normal in a few days and the child was discharged from hospital after 5 days. A diagnosis of bronchopneumonia was made, but in view of the history of a recent gastro-intestinal upset the faeces were examined and an organism of the salmonella group was isolated.

The child lived in a house situated within a few yards of a knackery. The father of the child, who was a cattle dealer and the owner of the knackery, constantly handled the carcasses of diseased farm animals.

On MacConkey and nutrient agar plates the microorganism produced colonies typical of those of the salmonella group. Glucose, maltose, mannitol, dulcitol, sorbitol, arabinose, rhamnose, xylose, trehalose, and inositol were fermented with the production of acid and gas within 24 hours incubation. After 30 days incubation there was no fermantation of lactose, sucrose, salicin, adonitol, inulin, or raffinose; gelatin was not liquefied; neither urease nor H_2S was produced. The strain was M.R.+, V.P.-, indole - and d-tartrate +. Both citrate and mucate were utilised.

Serological examination showed that the organism was agglutinated to titre by a S. schleissheim (4, 27, 12) serum, and that S. schleissheim was agglutinated to titre by a serum made with the new serotype. Reciprocal absorption tests proved that their somatic antigenic structure was identical (4, 27, 12). The new serotype was diphasic, phase 1 being agglutinated to titre by a S. deversoir H (c) serum, and

phase 2 by a S. kentucky H (z_6) serum. Reciprocal absorption tests of these sera and of the serum made with the new serotype confirmed the flagellar antigenic structure as c - z_6.

SUMMARY

A new salmonella serotype with the antigenic structure 4, 27, 12 ; c - z_6 has been described. The proposed name is Salmonella bury.

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ANALYSIS OF THE GENUS SELENOMONAS WITH RESPECT TO ITS TRANSFER TO THE PROTOZOA

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Lewis (1884) described an organism from the human mouth which he considered to be related to the cholera vibrio of Koch. This was incorporated into the classification of Flügge (1886) and of Trevisan (1885), being named Spirillum sputigenum by the former author, while Trevisan earlier employed the name Pacinia lewisi.

Miller, in a number of papers (1887, 1892, 1906), described Spirillum sputigenum from the human mouth, but failed to culture it. This organism was described by Hoffman and von Prowazek (1906) as being peritrichously flagellate. The extreme instability of the component fibrils of the compound flagellum and its liability to produce such appearances are referred to later in this review.

Löwenthal (1906) appears to have been the first to describe any internal structures in this organism when he noted the presence of possible nuclear material, "one or two nuclei."

Certes (1889) found a similar organism in the rumen of cattle to which he applied the name Ancyromonas ruminantium. This organism, however, showed no resemblance to the generic diagnosis of Ancyromonas as given by Kent (1880). This has been pointed out by Wenyon (1926).

Kerandel (1909) observed organisms in the blood of antelope and other game shot in the Congo and noted the resemblance between his forms and those described by Miller (1887 et seq.) and by Certes (1889).

In the same year as Kerandel described his organisms, the flagellation and motility of Spirillum sputigenum (Miller) were studied by Yamamoto (1909) and Muhlens (1909). The latter reported the presence of 1-3 flagella, most cells possessing one thick flagellum, arising from the centre of the concave side.

Braune (1913) reported an organism from the rumen of the ox and named it Callimastix frontalis, presumably because it resembled the organism from the body cavity of a Cyclops sp. described by Wissenberg (1912). Braune's organism was spherical, possessing "a number of flagella,

arising from one small area of the spore, each being derived from a blepharoplast and possessing a complicated neuromotor-apparatus." Wenyon (1926) considers that this may be a stage in the life cycle of Selenomonas palpitans. In the present writer's experience the very rare occurrence of such organisms in the guinea pig caecum, even in relatively dense populations of Selenomonas, contra-indicates this conclusion. Those forms which have been noted in this situation appear to have been degenerate and may represent pathological changes rather than a life cycle. The possibility, however, of unknown forms occurring as part of a life cycle cannot be ruled out at present.

Braune (1913) also described his organism as possessing a single nucleus with a large caryosome and thus distinct from the nuclear apparatus of Selenomonas (Jeynes, 1955).

Wenyon (1926) in summing up gives the characteristic features of Callimastix frontalis as: (a) number of flagella arising from a row of blepharoplasts, and (b) flagella arranged in one plane and appearing as if united to form a band 30μ in length.

Fonseca (1916) also reports this organism from cattle, sheep, and goats in South America.

von Prowazek (1913), in a study of Spirillum sputigenum came to the conclusion that it was not a member of the genus Spirillum and suggested the generic name Selenomonas. This paper was published under conditions which fulfilled the Rules of the Bacteriological Code, with the exception that a type species was not described. The name which would arise as a result of this transfer, Selenomonas sputigena (Flügge) von Prowazek, was not in fact used in that paper. Von Prowazek also considered the organism described by Certes (1889), Ancyromonas ruminantium, to be a member of his new genus. Again, however, he did not actually employ the combination which would arise under the conditions of transfer, Selenomonas ruminantium (Certes) von Prowazek.

While the organisms observed in the blood smears are not known to be identical with those of Certes (1889), it is more likely that they are rumen or caecal forms than of oral origin. The flagellates examined in blood smears by Kerandel certainly resulted from mechanical damage to the gut and associated blood vessels, since his animals were shot prior to examination. In von Prowazek's examinations, other organisms of intestinal origin were found, confirming this

view. This being the case, the type species obviously indicated would be Selenomonas ruminantium (Certes) von Prowazek.

Giesberger (1936) having re-examined the problem of the flagellation of Spirillum sputigenum placed it in the genus Selenomonas as diagnosed by von Prowazek.

Later in 1913, Woodcock and Lepage described in some detail an organism found in the rumen of sheep and goats. This they considered had a life cycle which involved the interconversion of two forms, flagellate crescents and aflagellate ovals. The crescents had the same form as those described by earlier workers. The ovals, although apparently aflagellate were said to be capable of motility and possessed a better defined cell wall than the crescents. The latter were also reported to be capable of motion independently of the flagellum, presumably by "muscular" movement of the cell wall.

The name applied to these forms was Selenomastix ruminantium (Certes) Woodcock and Lepage. The paper of von Prowazek transferring Ancyromonas ruminantium Certes to the genus Selenomonas antedates that of Woodcock and Lepage by a few months.

Selenomastix is to be rejected also on the grounds of having been applied to two distinct organisms. This has been pointed out recently (Oxford, 1955).

In discussing the taxonomy of the crescents, Woodcock and Lepage suggest that they may be "Proflagellates" or "Proprotozoa."

The observation of crescentic laterally flagellate organisms in the caecal contents of the guinea pig was made by Da Cunha (1915) and closely followed by Fonseca (1916).

Simons (1920) mentions very briefly the occurrence in the guinea-pig caecum of an organism resembling those described by von Prowazek. This was followed by a further paper (Simons, 1921) in which he suggested that the organism from this source should be named Selenomonas palpitans.

Boskamp (1922) described the guinea-pig organism, apparently accepting Simons' specific epithet, and also termed Miller's mouth flagellate, Selenomonas sputigena. He agreed with the "muscular" movement hypothesis and suggested that the organisms should be included with the Spirillaceae. He adds, however, that further study should be undertaken before deciding upon a final classification.

Knoor (1922, 1923) described the culture of Spirillum sputigenum. He also draws attention to the symbiotic co-relationship of this organism with the mouth fusiform bacteria.

Ford (1927) confirmed the flagellation as normally consisting of a single thick compound flagellum attached laterally to the concave side of the crescent.

Wenyon (1926) places the guinea-pig strain in the family Monadidae Kent, with the generic diagnosis of von Prowazek (1913).

Dobell (1932) described the oral strain and shows that this is one of the human mouth organisms observed by van Leeuwenhoek in 1683 (Letter 39. Diagrams B, C, D). After describing its culture and cytology, Dobell states "Spirillum sputigenum" (Miller, 1890). This is not really a Spirillum at all, but belongs to the genus Selenomonas, Prowazek (1913)".

The genus Selenomonas was recognised by Neveu Le Maire (1942) and included in the Protozoa, as also by McGaughey and Sellars (1948).

Lessel and Breed (1954) reiterated the conclusions of Boskamp (1922) and classified it in the family Spirillaceae (Migula), although apparently not intending the use of the generic name Spirillum.

The status of the generic name Selenomonas von Prowazek has been discussed recently in these pages from the aspects of its validity for inclusion in Bacterial Nomenclature (Judicial Commission, 1955).

Oxford (1955) pointed out that as the crescents and ovals described by Woodcock and Lepage (1913) are almost certainly distinct organisms, the generic name Selenomastix as applied to the crescents is invalid on the grounds of uncertainty.

Quin (1943) having studied the ovals found in the rumen contents of Merino sheep, showed the fermentation of glucose and storage of glycogen by these organisms. Despite the motility which these ovals are reported to possess, Quin apparently considered them to be yeasts as he applied the name Schizosaccharomyces ovis. McGaughey and Sellars (1948) and van der Westhuizen and Oxford (1955) have pointed out the error of this conclusion and this has been reiterated by Oxford (1955).

The latter writer indicates that a case could be made for the application of the name Selenomastix ruminantium

Woodcock and Lepage to the ovals; the crescents having been transferred to the genus Selenomonas. The derivation of the generic name seems rather unsuitable in this case, as the ovals bear no relationship to the shape of the moon. The name would, however, antedate Schizosaccharomyces ovis for the ovals, the latter name being invalid since it is legitimately applied to a genus of yeasts.

The affiliations of the genus Selenomonas with the protozoa have been pointed out on the basis of cytological observations (Jeynes, 1955) together with the error of classification among the bacteria.

The cytological appearance of bacteria and especially the spirilla are entirely different from those observed in Selenomonas (Bisset, 1955).

From the foregoing analysis it is felt that the following proposals are both logical and generally acceptable in the circumstances:

1. The generic name Selenomonas von Prowazek is valid and represents a genus of flagellate protozoa.

2. The type species should be Selenomonas ruminantium (Certes) von Prowazek.

3. The genus should be placed provisionally in the family Monadidae Kent.

4. Should transfer to a new family or subfamily prove desirable, when more information of taxonomic value is available, this should be named Selenomonadidae.

5. The following species should be recognized within the genus:

   a. Selenomonas ruminantium (Certes) von Prowazek.

      Type species. Unicellular crescents, motile by means of a single compound flagellum attached, typically, to the centre of the concave side. Motility irregular and tumbling. Possibly motile also by action of the cell wall. Strict anaerobe. Not cultured. Gram-negative c 6.0μ x 1.8. From the rumen of sheep, goats, oxen, cattle, and antelope. Wide geographical distribution.

b. Selenomonas sputigena (Flügge) von Prowazek.
Unicellular crescents, sometimes almost rod-like, 1.0-2.5μ long by 0.3-0.5μ (the width may be slightly exceeded in rare cases). Motile by single compound flagellum attached laterally to the concave side of the crescent. Not observed to be motile by cell wall movements. Strict anaerobe. Culturable with difficulty, but more easily in association with oral fusiform bacteria. Gram-negative. From tooth deposit and oral cavity of healthy humans. Not known to be pathogenic. Widely distributed.

c. Selenomonas palpitans Simons.
Unicellular crescentic organism motile by means of single compound flagellum attached at the centre of the concavity of the crescent. Flagellum attached to a blepharoplast and neuromotor apparatus. Possibly motile also by "muscular" movement of cell wall. Gram-negative. Not cultured. Pleomorphic and variable in size, typically 6.5-9.5μ x1.5-2.5μ. From the guinea-pig caecal contents.

The name S. palpitans is retained for the guinea-pig strain on the grounds of familiarity and also that the incomplete information available and its pleomorphic nature make an assessment of its relationships to S. ruminantium difficult.

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A NEW SALMONELLA SEROTYPE, SALMONELLA FREETOWN (38 : y : 1,5)

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A seven-months-old African baby boy, living in Sierra Leone, had suffered from pyrexia and diarrhoea for three weeks before being sent to a hospital. On admission, the child looked ill, was listless, slightly dehydrated, and had a temperature of 102°. He took his food well, did not vomit, and the faeces, which were formed, were greenish in colour and contained some mucus but no ova or protozoa. Two days later, an organism of the salmonella group was isolated from the faeces. On the fourth day after admission to the hospital, the child died. Sera taken from three contacts gave negative results with H and O suspensions of the organism. The latter was not isolated from any sample of faeces examined from the local animals and no other strains have been identified.

The organism produced a typical salmonella colony on Mac Conkey agar, fermented glucose, maltose, mannitol, dulcitol, sorbitol, arabinose, rhamnose, xylose, and trehalose, with the production of acid and gas in 1 day; acid only was produced in raffinose after 6 days incubation, failed to ferment lactose, sucrose, salicin, adonitol, inulin, and inositol. This organism failed to form indol and urease, and to liquefy gelatin; it produced H_2S and utilized citrate and mucate; the d-tartrate and M.R. tests were positive and the V.P. test negative.

Serological tests showed that the organism was agglutinated to titre by a S. inverness serum and reciprocal absorption tests proved that the somatic antigen structure of S. inverness and of the new serotype were identical. The organism was also found to be diphasic, phase 1 being agglutinated to titre by a S. tel aviv H (y) serum, and phase 2 by a S. thompson var. berlin H (1,5) serum. Reciprocal absorption tests confirmed the antigenic identity of both the flagellar phases to be H = y - 1,5.

SUMMARY

A new serotype (Salmonella freetown) is described. This organism, having the antigenic structure 38 : y : 1, 5, was isolated from an African baby who subsequently died of diarrhoea.

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DESIGNATIONS FOR THE K ANTIGENS OF ESCHERICHIA COLI SEROTYPES

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The K antigens of Escherichia coli serotypes compose a class of somatic antigens that is divisible into at least three varieties, L, A, and B, based upon differences in physical properties.* All known E. coli K antigens occur as envelopes, sheaths, or capsules and inhibit agglutination of living bacterial suspensions in O antisera. This inhibitory effect on O agglutination is inactivated by heat, either at 100°C or at 121°C, depending upon the variety of K antigen present in a particular serotype.

As presently constituted, the E. coli antigenic schema contains 77 delineated K antigens; 30 L, 26 A, and 21 B antigens. These 77 antigens are numbered consecutively from 1 to 77 with K antigen numbers. However, it has been the practice in the past to assign not only a K antigen number but also a separate B antigen number to each new B antigen as it was described. When the number of B antigens was small, this dual system of numbering was innocuous, but now that it is known that there are many B antigens in the E. coli group the dual system has become cumbersome and has led to confusion. Several alternative methods were suggested and after consideration of the advantages and disadvantages of each, the writers adopted the following principles and wish to propose them for use in the designation of E. coli K antigens in the future.

* For detailed discussions of the differences between the varieties of K antigens, the reader is referred to:

Edwards, P.R., and W.H. Ewing. Identification of Enterobacteriaceae. Burgess. Minneapolis. 1955.

Kauffmann, F. Enterobacteriaceae. 2nd Ed. Munksgaard. Copenhagen. 1954.

1. To continue to assign consecutive K antigen numbers to newly described K antigens, whether they be of the L, A, or B variety.

2. To stop the assignment of separate B antigen numbers.

3. In writing the antigenic formula of an E. coli serotype, the variety of K antigen contained in the serotype should be indicated, e.g.,

   01 : K1 (L) : H7
   08 : K8 (A) : H4
   018 : K76 (B) : H14

4. For the next few years the formulas of those serotypes that possess described and numbered B antigens may be written as follows:

   026 : K60 (B6) : H11
   055 : K59 (B5) : H6
   0111 : K58 (B4) : H12

Later, when investigators become more accustomed to the K antigen numbers, the B antigen numbers should be dropped from the written formulas, e.g.,

   026 : K60 (B) : H11
   055 : K59 (B) : H6
   0111 : K58 (B) : H12

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CONSERVATION OF THE GENERIC NAME CHROMOBACTERIUM AND DESIGNATION OF TYPE SPECIES AND TYPE STRAINS

Request for an Opinion

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To the Judicial Commission:

I. The status of the generic name Cromobacterium Bergonzini.

1. The name Cromobacterium was used by Bergonzini (1879) to include the pigmented species of the genus Bacterium Cohn (1872). Bergonzini divided each of Cohn's genera which contained pigmented bacteria--thus Micrococcus was divided into Micrococcus for nonpigmented species and Cromococcus for pigmented species and Bacillus into Bacillus and Cromobacillus. Bergonzini wrote (1879, p.38) "Il Gen: Bacterium come il gen. Micrococcus puo venir diviso in due sezioni:

Bacteri incolori (Bacterium)
Bacteri colorati (Cromobacterium)"

He listed four species of Cromobacterium with descriptions. These are, in order:

(1) Cromobacterium syncyanum (sic) (pro synon. Bacterium syncyanum Schroet., Vibrio syncyanus Ehr.).

(2) Cromobacterium aeruginosum (pro synon. Bacterium aeruginosum Schroeter).

(3) Cromobacterium brunneum (pro synon. Bacterium Brunneum Schroet.).

(4) Cromobacterium xanthinum (pro synon. Bacterium xantinum (sic) Schroet., Vibrio synxanthus Ehr.).

The references are evidently to Schroeter (1872) and Ehrenberg (1840). Cromobacterium brunneum is unrecognisable, but species 1, 2, and 4 are now usually classified in the genus Pseudomonas, (being the bacilli of blue milk, of green pus, and of yellow milk, respectively). The second is the type species of the genus Pseudomonas nomen conservandum (Judicial Commission, 1952; Editorial Board, 1953a). The name Cromobacterium appears to be validly published in 1879 since it is accompanied by a description and by a redescription of Cohn's genus viz. "Bacteri lineari diritti Bacterium." It is uncertain whether the name ranks as a genus or a subgenus, but these are co-ordinate in nomenclature.

2. In 1880, Bergonzini added another species, the violet bacterium which he discovered and named Cromobacteriun (sic) violaceum (the last letter of the generic name is a misprint, and the name is spelt with a final m on p.37 Parte officiale). He specifically stated that it was a new species and was not Bacteridium violaceum Schroeter, 1872 (Micrococcus violaceus Cohn 1872) which Bergonzini (1879 p.37) called Cromococcus violaceus. Following is his diagnosis: * Cromobacterium violaceum - "Elementi cellulari cilindrici per lo più isolati, 2 a 3 volte cosi lunghi come larghi dotati di movimento oscillante, colorate in violetto da una sostanza + speciale insolubile nell'acque, - Grossezza da 0,6 a 1 μ ; lunghezza da 2 a 3μ. Vegetano specialmente nelle soluz. d'albume d'ovo." The name is validly published.

3. The spelling of the generic name was corrected to the † form Chromobacterium in a review of Bergonzini's second paper (anonymous, 1881). Bergonzini's spelling was evidently the usual Italian transliteration of the Greek root, but was clearly intended as a Latin form; it is presumably an orthographic variant. The emended spelling has been generally followed since then (Grove, 1884; de-Toni and Trevisan, 1889; and Buchanan, 1918). The exact date of Bergonzini's second paper is doubtful; the title page of the volume is dated 1881, but there is no indication of whether it was issued in parts during 1880. The paper was read to the Society on 22nd June, 1880. Another review (Zimmermann, 1880) appeared in Section 49/50 of the Botanische Centralblatt, 1880, but the day or month of issue are not given on the Sections.

+ See Errata - p. 157

4. In 1918, Buchanan revived the name Chromobacterium as a genus, emending the description so as to include virtually only the violet chromogenic bacteria of the Bacterium violaceum group. His description was as follows: "Rod-shaped bacteria, without spores, aerobic, producing a violet chromoparous pigment soluble in alcohol but not in chloroform, motile or non-motile, Gram-stain variable. The type species is Chromobacterium violaceum Bergonzini." This designation of the type species is illegitimate under Rule 9 (2) c 2 of the Revised International Code of Bacteriological Nomenclature (Ed. Bd., 1953b, p.42: Jud. Com., 1953, p.145; Intl. Com., 1953, Min. 6, p.158) since the type must be one of the species included in the first publication of the name.

† 5. The genus Chromobacterium Bergonzini emend. Buchanan may therefore be illegitimate on one or more of the following grounds: a) It may be a synonym of Pseudomonas nom. conserv. b) It has as type species a species which is not permissible as type species. c) The type species is unrecognisable and, being probably based on a mixed culture, may be a nomen confusum (see III, 2 below).

6. Enlows (1920, p.74) gives Pseudomonas violacea Migula 1894 (which belongs to the Bacterium violaceum group) as the type species of Pseudomonas by monotypy, but the name of this species was not validly published in 1894 (see Editorial Board, 1951). Although this species is one of those listed in Pseudomonas Migula 1895, it is not the type species and is now generally considered not to belong to that genus. Gieszczykiewicz (1939) gives the type species of Chromobacterium as C. prodigiosum; this is illegitimate under Rule 9 (2) c 3 (Editl. Bd., 1953b, p.42; Judl. Comm., 1953, p.145; Internatl. Comm., 1953, Minute 6, p.158).

7. If Chromobacterium Bergonzini emend. Buchanan is illegitimate, then either it can be conserved, or a new generic name can be created. Conservation would be in accord with the principle of fixity of names, and a new name would cause confusion, since this generic name has been in general use since 1918. As explained below (III, 2) the type species is unrecognisable, and conservation would therefore have to be accompanied by the designation of a recognisable type species and preferably of a neotype strain.

† See Errata - p. 157

8. It would be more in accord with the principles of nomenclature to conserve the name Chromobacterium Bergonzini 1880 emend. Buchanan 1918 rather than Cromobacterium Bergonzini 1879, since the former is closer to the concept of the genus as it is used today. Cromobacterium Bergonzini 1879 should then be placed in the list of nomina genera rejicienda.

9. An Opinion of the Judicial Commission is requested on the correct citation of the generic name, if it is conserved, and to whom it should be ascribed.

II. Summary of taxonomy and synonymy.

1. There has been little work on the taxonomy of the genus, the most valuable being that of Cruess-Callaghan and Gorman (1935). Their classification has not proved wholly satisfactory. A recent study of thirty-eight strains (Sneath, 1956) showed that they fell into two distinct groups, which are here referred to as the mesophilic and psychrophilic groups. The mesophilic strains grow at 37° but not at 4°, are markedly proteolytic and are facultatively anaerobic. The psychrophilic strains grow at 4° but not at 37° and are poorly proteolytic and strictly aerobic. A number of other characteristics were also correlated with this division.

2. The two groups appear to be closely related; they both form the same pigment, violacein, and show both polar and peritrichate (lateral) flagella. They should be regarded as two species within the genus Chromobacterium.

3. The usage of Topley and Wilson (1929), who include in the genus the Bacillus prodigiosus group (Serratia) and various yellow chromogens, does not now seem justified. However, none of the proposals submitted here will make it confusing for those who subscribe to such an opinion.

4. Most of the early descriptions of blue and violet chromogenic bacteria are too poor for recognition of the genus or the species to which the organisms belonged.

Bacteria of this genus which are recognisable with a fair degree of certainty as mesophils, with their synonomy, are:

(i) Bacillus violaceus Eisenberg, 1888 p.8. (Violetter bacillus Eisenberg, 1886 Tab.2, No.4. Bacillus violaceus Eisenberg, 1891 p.91; de Lagerheim, 1891 p.77 in part.)

(ii) Bacillus violaceus Laurentius Jordan, 1890 p.838, Pl.IV, Fig.10. (Bacillus violaceus Laurentius Roux, 1892 p.308; Lustig, 1893 p.103; Voges, 1893 p.302; Sternberg, 1893 p.631; Kruse in Flügge, 1896 (ii) p.312; Matzuschita, 1902 p.136; Calderini, 1925 p.767; Godfrin, 1934 pp.90, 231. Bacillus violaceus laurentius Dyar, 1895 p.372. Bacillus Violaceus Laurentius Horrocks, 1901 p.68. Bacterium violaceus (sic) Laurentius (sic) Chester, 1897 p.117. Bacterium Laurenti (sic) Enderlein, 1925 p.281. Bacillus violaceus Chester, 1901 p.262. Pseudomonas Laurentia Migula, 1900 p.944; Migula, 1901 p.384. Pseudomonas janthina Chester, 1901 p.317 in part. Chromobacterium violaceum laurentium Ford, 1927 p.470.)

(iii) Bacterium ianthinum Lehmann and Neumann, 1896 (i) Taf.27, (ii) p.264. (Bacterium violaceum Lehmann and Neumann, 1899 (i) Tab.23, (ii) p.262; Cunningham and Raghavachari, 1924 p.1285. Chromobacterium violaceum Bergey et al., 1939 p.92, 1948 p.231 in part.)

(iv) Bacille bleu van der Sleen, 1894 No.26, Pl.VII, Fig.26.

(v) Bacillus violaceus Manilae Wooley, 1904 p.1. (Bacillus violaceus Manilae Wooley, 1905 p.89. Chromobacterium violaceum Manilae Ford, 1927 p.471. Chromobacterium violaceum var. manilae Schattenberg and Harris, 1942 p.509.)

(vi) Bacillus violarius acetonicus Bréaudat, 1906 p.879. (Bacillus violarius acetonicus Godfrin, 1934 pp.91, 232. Bacillus violaceus (sic) acetonicus Lehmann and Neumann, 1920 (ii) p.476; Calderini, 1925 p.772. Bacillus violaceus acétonicus Guillerin, 1929 p.38.

Aerobacillus violarius Donker, 1926 p.141 quoted in Bergey et al., 1948 p.720. Variety of Bacillus polymyxa Bergey et al., 1938 p.720.)

(vii) Bacille violet pathogène Gauducheau, 1907 p. 278. (Bacille violet pathogène de Gauducheau Godfrin, 1934 pp.104, 238.)

(viii) Bacillus violaceous (sic) Minett, 1913 p.44.

(ix) Bacterium violaceum Cunningham and Raghavachari, 1924 p.1285.

Bacteria of this genus which are recognisable with fair certainty as psychrophilic, with their synonomy, are:

(i) Bacillus janthinus Plagge and Proskauer, 1887 p.464. (Bacillus lividus Eisenberg, 1891 p.81; Roux, 1892 p.303; Germano, 1892 p.517; Voges, 1893 p.303; Sternberg, 1893 p.621; Chester, 1901 p.262; Matzuschita, 1902 p.140; Calderini, 1925 p.769; Godfrin, 1934 pp.97, 235. Bacterium lividum Migula, 1900 p.339 in part. Bacterium lividus (sic) Chester, 1897 p.117. Bacillus violaceus Lustig, 1890 p.88, 1893 p.75 in part; Matzuschita, 1902 p.50 in part. Bacillus Berolinensis Chester, 1901 p.305 not Bacillus Berolinensis Migula, 1900 p.856, not Bacillus berolinensis Macé, 1913 (ii) p.411. Bacillus violaceus Berolinensis Kruse in Flügge, 1896 (ii) p.311 in part. Bacillus Violaceus Berolinensis Horrocks, 1901 p.68 in part. Pseudomonas violacea Pribram, 1933 p.49. Chromobacterium lividum Holland, 1920 pp.219, 222; Bergey et al., 1923 p.119, 1925 p.124, 1930 p.158, 1934 p.170.)

(ii) Bacillus janthinus Macé, 1889 p.528. (Bacille violet Macé 1888. Bacillus janthinus Macé, 1897 p.585, 1901 p.920, 1913 (ii) p.414.)

(iii) Bacillus janthinus Zimmermann, 1890 pp.84 (36), 140 (92). (Bacillus janthinus Zimmermann, 1893 Taf.2 Fig.13; Voges, 1893 p.303; Lustig, 1893 p.76 in part; Godfrin, 1934 pp.95, 234 in part; Pseudomonas ianthina Migula, 1900 p.941 in part.)

+ See Errata - p. 157

(iv) Bacillus membranaceus amethystinus Eisenberg, 1891 p.421. (Bacillus membranaceus amethystinus Germano, 1892 p.516; Voges, 1893 p.302; Sternberg, 1893 p.634; Frankland and Frankland, 1894 p.474; van der Sleen, 1894 No.25, Pl.VII, Fig.25; Miquel and Cambier, 1902 p.695; Godfrin, 1934 pp.99,236. Bacterium membranaceum amethystinum Cruess-Callaghan and Gorman, 1935 p.216. Bacillus amethystinus Kruse in Flügge, 1896 (ii) p.312; Matzuschita, 1902 p.238; Calderini, 1925 p.769; Macé, 1897 p.856. Bacterium amethystinum Migula, 1900 p.491; Chester, 1901 p.179; Enderlein, 1925 p.281. Bacterium amethystinus (sic) Chester, 1897 p.117. Bacillus Amethystinus Horrocks, 1901,p.69. Chromobacterium amethystinum Holland, 1920 pp.217, 222; Bergey et al., 1923 p.121, 1926 p.~~161~~ p.126, 1934 p.173, 1939 p.94, 1948 p.232.)

(v) Bacillus membranaceus amethystinus mobilis Germano, ~~1902~~ p.516. (Bacillus membranaceus amethystinus mobilis Miquel and Cambier, 1902 p.690; Bacillus amethystinus mobilis Kruse in Flügge, 1896 (ii) p.313; Matzuschita, 1902 p.138; Calderini, 1925 p.770. Bacillus Amethystinus Mobilis Horrocks, 1901 p.69. Bacterium amethystinus (sic) mobilis Chester, 1897 p.117. Pseudomonas amethystina Migula, 1900 p.944, 1901 p.385. Bacillus amethystinus Chester, 1901 p.262. Bacillus membranaceus amethystinus var. "mobilis" Godfrin, 1934 p.99. Bacterium violaceum var. amethystinum Pribram, 1919 p.7.)

(vi) Bacillus lividus Zimmermann, 1893 p.94. (Bacterium lividum Migula, 1900 p.339 in part. Bacillus Lividus Horrocks, 1901 p.68. Bacillus pseudolividus Matzuschita, 1902 p.168; Calderini, 1925 p.769.)

(vii) Bacillus violaceus diffusus Ajtai, 1897 p.666. (Stamm violaceus diffusus Aitay (sic) Bampton, 1913 p.134.)

(viii) Violet bacillus Ward, 1898 p.59, Figs.1-10.

(ix) B. membranaceus amethystinus Stamm I Bampton, 1913 p.135. (Bacillus membranaceus amethystimus (sic) I Godfrin, 1934 pp.102,237. Chromobacterium

* See Errata p.157
+ See Errata - p.157

membranaceum Bergey et al., 1923 p.119, 1926 p.125, 1930 p.159, 1934 p.171. Chromobacterium membranaceum amethystinum I Ford, 1927 p.472.

(x) B. membranaceus amethystinus Stamm II Bampton, 1913 p.137. (Bacillus membranaceus amethystimus (sic) II Godfrin, 1934 pp.103, 237. Chromobacterium bamptonii Bergey et al., 1923 p.119, 1926 p.124, 1930 p.159, 1934 p.171. Chromobacterium membranaceum amethystinum II Ford, 1927 p.473.)

(xi) Chromobacterium cohaerens Grimes, 1930 p.383.

(xii) Bacillus janthinus var butyricus Deshuesses and Novel, 1939 p.7.

*See Errata - p.157

Bacteria probably belonging to the genus but species incertae sedis.

Bacillus violaceus Schröter, 1886 p.157; bacille violet Macé, 1887 p.354 (Bacillus violaceus Lutetiensis Kruse in Flügge, 1896 p.311); Bacteridium violaceum Schroeter, 1872 pp.124, 126 (Micrococcus violaceus Cohn, 1872 p.157); Chromobacterium hibernicum Grimes, 1930 p.382; Bacterium violaceum Trelease, 1885 p.205, Pl.12, Fig.9; Cromobacterium violaceum Bergonzini, 1880 p.153; Pseudomonas pseudovioleacea Migula, 1900 p.943; violetter Bacillus Maschek, 1887 p.71; Bacterium violaceum Wolff, 1911 p.643; Bacillus violaceus Frankland and Frankland, 1889 p.394; Bacillus violaceus Zimmermann, 1890 pp.82(34), 140(92); Bacterium ianthinum Zopf, 1883 p.68; Bacteria violada de Lagerheim, 1891 p.74; violetter Bacillus Hueppe, 1884 p.365; Bacillus janthinus Wright, 1895 p.450; Bacillus janthinus Voges, 1893 p.312; Bacillus janthinus Flügge, 1886 p.291; Bacillus ianthinus Lustig, 1893 p.76; Bacillus janthinus Tils, 1890 p.311; Bacillus membranaceus amethystinus van der Sleen, 1894 No.25, Pl.VII, Fig.25; Bacillus violaceus Lustig, 1890 pp.88, 89; Groups VI and VII Calderini, 1925 p.779; Bacillus janthinus Jordan, 1890 p.840, Pl.XII, Fig.12.

Bacteria not belonging to the genus Chromobacterium or of doubtful relationship, but liable to be confused with Chromobacterium.

(i) Bacteria not belonging to Chromobacterium (Gilman, 1953; Sneath, 1956).

Chromobacterium viscosum Grimes, 1927 p.368; Chromobacterium chocolatum Gilman, 1953 p.48 (Chromobacterium chocolatum, Chromobacterium organium of Lasseur et al., 1944 p.293, Pl.10, Figs.1-3 ex Knutsen); Chromobacterium ianthinum Gilman, 1953 p.48; Chromobacterium iodinum Davis, 1939 p.273; Pseudomonas aeruginosa (Schroeter, 1872 pp.122, 126) Migula, 1900 p.884).

(ii) Bacteria possibly related to Chromobacterium vicosum Grimes.

Bacterium cyaneum Leonard, 1904 p.398; Bacterium coelicolor Müller, 1908 p.195; Bacterium visco-fucatum Harrison and Barlow, 1905 p.97; Bacillus coerulefaciens McFarlane, 1895 p.935; Bacillus budapestinensis α and β Ajtai, 1897 pp.659, 662; Bacillus violaceus sacchari Agar, 1894 p.265.

(iii) Probably Pseudomonas spp.

Bacillus Le Monnieri Lasseur, 1913 p.47; Pseudomonas cattleyaecolor Marchal and Lotz, 1953 p.37; Pseudomonas syncyanea (Ehrenberg, 1840 p.202) Migula, 1895 p.29; B. cyaneofluorescens Zangemeister, 1895 p.321; Bacterium anthocyaneum Reiss, 1912 p.129; Bacillus caryocyaneus Dupaix 1930 ex Beijerinck (see Dupaix, 1933 p.13); Pseudomonas Beijericnkii Hof, 1935 p.152; Pseudomonas mildenbergii Bergey et al., 1948 p.96 (Blaubacillus Mildenberg 1922).

(iv) "Indigo bacteria."

Bacillus indigoferus Zimmermann, 1893 p.92 (Indigo bacillus of Claessen 1890); Bacillus indigoferus Voges, 1893 p.307; Pseudomonas indigofera var. immobilis Elazari-Volcani, 1939 p.350, Fig.3; Bacillus pavoninus Forster apud van der Sleen, 1894 No.59; Bacillus coeruleus Smith, 1887 p.758: Bacille bleu IV Macé quoted in Godfrin, 1934 pp.72, 226.

* See Errata - p.157

(v) Genus uncertain.

Micrococcus cyanogenus Pammel and Combs, 1896 p.136; Bacteridium cyaneum Schroeter, 1872 pp.122,126 (Micrococcus cyaneus Cohn, 1872 p.156 in part); Micrococcus pseudo cyaneus Schroeter, 1886 p.145 (Micrococcus cyaneus Cohn 1872 in part); Bacillus Lacmus Schroeter, 1886 p.158; Blauer Coccus Maschek, 1887 p.67; Actinococcus cyaneus Beijerinck, 1913 p.198; Bacterium cyaneus (sic) White, 1906 p.16; Bacillus Violaceus Flavus, McFarlane 1895 p.939; Violetter Coccus Maschek, 1887 p.68; Bacillus violaceus sacchari Dyar, 1895 p.369; Merismopedia violacea Kützing, 1849 p.472; Pigmentbildender Diplococcus Klamann, 1887 col. 1347; Bacillus coeruleus Eckstein, 1894 p.14; Bacillus bruntzii Nepveux, 1920 p.742; Bacillus polychromogenes Thiry, 1900 p.9; Bacillus cyaneo-fuscus Beijerinck, 1891 p.308; Halobacter innocens violet var. Anderson, 1954 p.267. Chromobacterium marismortuae Elazari-Volcani 1940, pp. VII, 76; Bacillus caeruleus Voges, 1893 p.303; Bacterium h Rosenberg, 1886 p.458; Bacillus of Günther and Spitta, 1899 p.108; Blaugrüner Bacillus Maschek, 1887 p.78; Bacterium cristallino violaceum Cholkevitch, 1922 quoted by Godfrin, 1934 pp.93,233; Bacillus coeruleus Wright, 1895 p.451; Bacillus lilacinus Macé, 1913 (ii) p.416; Mikrococcus sublilacinus Matzuschita, 1902 p.222 (Coccen 26, Lembke 1896 p.317); Chromobacterium nubile Ford, 1927 p.472 (Bacillus nubilis Frankland and Frankland, 1889 p.386.)

* See Errata - p.157

(vi) Probably belonging to the genera listed below.

Micrococcus: Micrococcus purpurifaciens Lehmann and Neumann, 1920 p.755; (Coccus of Dudschenko 1914);

Cornyebacterium: Aplanobacter insidiosum McCulloch, 1925 p.497;

Bacillus: Thermobacillus violaceus Feirer, 1927 p.52;

Klebsiella: Bacillus indigogenus Eisenberg, 1891 p.364; (bacille indigogène Alvarez 1887); Bacillus azureus Zimmermann, 1893 p.100.

(vii) Bacteria which were possibly Chromobacterium strains, but which are doubtful on account of discrepant features.

Bacillus violaceus sartoryi Waeldele 1938, quoted in Bergey et al., 1948 p.233 (see Sartory, Meyer and Waeldele 1938a, 1938b); Violet Lecoq de Boisbaudran 1882; violet bacillus Hartley 1913.

III. The designation of a type species and neotype strain.

1. Bergonzini's description of Cromobacterium violaceum shows that it was quite certainly one of the Bacterium violaceum group, since the pigment was almost certainly violacein from its chemical properties. It was soluble in alcohol but not in water; in ether it dissolved slightly, giving a solution of a more red hue than that of an alcoholic solution; hydrochloric acid turned it green, and potassium hydroxide made it reddish. These properties agree well with those of violacein (see Sneath, 1956).

2. The species of Bergonzini's organism is not recognisable for the following reasons: a) it formed a tough violet zoogloea on an unsterile solution of white of egg exposed to the air during experiments on putrefaction, while none of my thirty-eight strains grows well in white-of-egg solution (prepared as described by Bergonzini, but aseptically) and none forms a pellicle even after six months at room temperature: b) the temperature in Bergonzini's experiments would have allowed about equal growth of mesophilic and psychrophilic strains: c) it was never grown on any other medium: d) some subcultures gave a white membrane which was only violet in small patches, suggesting contamination: e) the culture could scarcely be uncontaminated with other bacteria, whose effect on the violet bacterium cannot be assessed: f) the violet bacterium may have come from the water used to make the medium or from the air, and the size of its cells affords no evidence as to its species.

3. In selecting a type species for Chromobacterium nom. conserv. prop., a number of courses are possible. The

most simple would be to re-establish Cromobacterium violaceum Bergonzini 1880, as the type species although its species is unrecognisable, and to attach the name to a recognisable species and to a neotype culture. In favour of this course are the facts that it need not be conserved over earlier names, and that it is the best-known name in the genus. Other possibilities would be to establish a different type based on (a) the first description recognisable as to species, (b) the first validly-named description recognisable as to species, (c) the first description bearing the epithet 'violaceum' which is recognisable as to species, or (d) the species which generally has had the epithet 'violaceum.' Possibilities a, b, c, and d would raise more problems of nomenclature and would not seem to be any more in accord with the principles of nomenclature, than the simpler solution. The species which would be the type under the four possibilities a - d given above appear to be: (a) Violetter bacillus Eisenberg 1886 syn. Bacillus violaceus Eisenberg 1888 (a mesophil), (b) Bacillus janthinus Plagge and Proskauer 1887 (a psychrophil), (c) Bacillus violaceus Eisenberg 1888 (a mesophil), and (d) probably a mesophilic bacterium. With the possibilities a - d, the combinations resulting from the union of the epithets with the name Chromobacterium would be illegitimate, as they would be later homonyms of combinations based on different, unrecognizable or incompatible types. Thus (a) and (c) Chromobacterium violaceum (Eisenberg), a mesophil, would be a later homonym of Cromobacterium violaceum Bergonzini and of Chromobacterium violaceum Bergey et al. 1939, a psychrophil, (b) Chromobacterium janthinum (Plagge and Proskauer), a psychrophil, would be a later homonym of Chromobacterium ianthinum (Zopf 1883) Bergey et al.1939, a mesophil; (d) if ascribed to any author other than Bergonzini would be a later homonym.

4. All these names appear to be illegitimate as nomina ambigua since they have been used for both mesophilic and psychrophilic bacteria by various authors. The least disturbance would be caused by attaching Cromobacterium violaceum Bergonzini 1880 to a mesophilic bacterium as proposed below.

5. There seems to be no cogent reason why the type should be a mesophil or a psychrophil, but if Bergonzini's species

is re-established as type, I propose that it should be a mesophil on the following grounds: (a) the epithet 'violaceum' is the commonest which was used by early authors for mesophilic strains, (b) mesophilic strains appear to have been more widely studied than psychrophils. Most of the oldest available cultures are mesophils, for instance those in the American Type Culture Collection, ATCC 553, 6357 and 7461.

6. I also propose that the name Chromobacterium violaceum Bergonzini 1880 be attached to the mesophilic strain MK (Sneath, 1956) (National Collection of Type Cultures 9757; American Type Culture Collection 12472) as neotype strain, since this was the most typical mesophilic strain I studied.

7. An Opinion of the Judicial Commission is requested on whether the correct citation of the proposed type species, if re-established, should be Chromobacterium violaceum Bergonzini 1880.

IV. The nomenclatural position after one species has been designated as type species.

1. There are, in my opinion, two clearly distinguishable species within the genus. Although further work may show that they should be further divided, it is important to fix the valid names and set up neotypes of the two well-defined species at present recognisable.

2. The type species will bear the epithet which is approved by the Commission. The position of the other species is examined below.

2A. If the type species be a mesophil as proposed.

The earliest description of a psychrophilic bacterium of this genus appears to be that of Plagge and Proskauer (1887). This bacillus was from water, and liquefied gelatin very slowly. The authors did not make it clear in their description whether the pigment was blue or violet, but failure to distinguish between these hues is common, and in their discussion they make it plain that they were referring to violet organisms. Eisenberg (1891), who redescribed the bacillus, refers

to the pigment as blue-black and as violet-blue. Despite the poor description, Plagge and Proskauer evidently had noticed the difference between the mesophilic and psychrophilic types in gelatin cultures, and (unlike most authors) had studied both.

The epithet 'janthinum' would be illegitimate, as Chromobacterium janthinum (Plagge and Proskauer) would be a later homonym of Chromobacterium janthinum (Zopf 1883) Holland 1920 and of C. ianthinum Bergey et al. 1939 p. 93. The last named is a mesophil, so the name would also be a nomen ambiguum. The first available epithet is 'lividum' given to the bacterium by Eisenberg (1891), and the valid name for the psychrophilic species appears to be Chromobacterium lividum (Eisenberg 1891) Holland 1920. Holland cites it as Flügge — Proskauer which is evidently a misprint. The statement of Bergey et al., 1923, that the optimum growth temperature of C. lividum is 35° is not supported by the earlier authors or by the other features they describe. It may have been a misprint and should not make the name a nomen ambiguum.

2B. If the type species be a psychrophil.

The first available epithet for a mesophil which is not barred by the considerations mentioned above is 'laurentium.' The valid name for the mesophilic species would then be Chromobacterium laurentium (Migula 1900) nov. comb. This is based on Bacillus violaceus Laurentius Jordan 1890 (syn. Pseudomonas Laurentia Migula 1900), which was undoubtedly a mesophil, since it grew at 37°, grew anaerobically, and liquefied gelatin rapidly.

3. If 'lividum' and 'laurentium' are rejected, the next available name for psychrophilic strains is Chromobacterium amethystinum (Kruse in Flügge 1896) Holland 1920, and for mesophilic strains it would be Chromobacterium violarium (Donker 1926) nov. comb.

4. If the Commission re-establishes Chromobacterium violaceum Bergonzini 1880, as type species and attaches it to a mesophilic bacterium, I propose for the psychrophilic species the name Chromobacterium lividum (Eisenberg 1891)

Holland 1920, with strain HB (Sneath 1956) (National Collection of Type Cultures 9796; American Type Culture Collection 12473) as neotype.

V. Description of the proposed neotype cultures.

The techniques are fully described in Sneath (1956). When tested by these techniques, the strains have the features given below. The incubation temperature is 25° unless otherwise stated. The two strains are typical members of the mesophilic and psychrophilic groups and their features were always or frequently present in the other strains of the same group.

Mesophilic strain MK (Sneath, 1956) (NCTC 9757, ATCC 12472).

Short rods with rounded ends, in young cultures averaging about 0.7 μ in breadth and 1.5 μ in length, arranged singly, or in pairs, showing bipolar staining and containing abundant fat globules, Gram-negative, not acid fast, no true metachromatic granules, no definite capsule, no spores. Motile, possessing a single polar flagellum (of length about 3 μ and wavelength about 2 μ) and in young agar plate cultures in addition several lateral flagella (of length 3 - 6 μ and wavelength about 1.2 μ).

Nutrient agar plate (2 days). Colonies about 1.5 mm in diameter, smooth, shiny, round, low convex, with entire edge, butyrous, easily emulsified, pale violet. Pigmentation commences in the centre of the colonies, and after 5 days the colonies are about 4 mm in diameter, violet-black, flat with lobate edge. Non-pigmented variants are uncommon. Plate cultures smell of hydrogen cyanide and of ammonia.

Gelatin plate (20°). On the second day the small round colonies sink into cups of liquefied gelatin.

Nutrient agar slope (2 days). Growth smooth, shiny, pale violet, slightly raised with finely lobate edge. Good pigment in 7 days, but consistency of growth not gelatinous.

Gelatin stab (20°). Filiform colourless growth along the stab, with button of surface growth. Liquefaction is rapid, infundibuliform, and is well marked in 7 days. A thick violet pellicle forms on the liquefied medium.

Nutrient broth (2 days). A fragile violet pellicle, easily sinking if disturbed, moderate turbidity and slight powdery deposit. After 4-5 days, a dark violet ring forms at the surface which is adherent to the glass, and is thin and powdery.

Löffler's serum slope (14 days). Moderate digestion of the medium causing furrowing or collapse. Pigmentation good.

Potato slope (7 days). A deep violet shiny growth, smooth and undulant.

The strain has the usual resistance of vegetative organisms to heat and phenol, and is penicillin resistant. It grows well anaerobically, between 10° and 37°, between pH7 and pH9, and on 3 per cent but not on 6.5 per cent NaCl agar. Single organisms often do not grow on the surface of agar media, and the inhibition is abolished by catalase. It utilises citrate slowly, but does not utilise malonate. Aerobic cultures produce hydrogen cyanide. The pigment (violacein) appears identical with that of strain HB, and is insoluble in water or chloroform, but is soluble in ethanol, in which solvent it shows maximum optical absorption near 580 mμ and minimum near 430 mμ.

Peptone water carbohydrates: acid without gas in glucose, fructose, mannose, and trehalose; doubtful acidity in maltose, sorbitol, glycerol, sorbose; no acid in sucrose, glycogen, lactose, L(+)arabinose, dextrin, starch, dulcitol, inositol, inulin, α-melibiose, adonitol, raffinose, melezitose, m-erythritol, salicin, mannitol, rhamnose, D(+)xylose, galactose.

Hugh and Leifson medium carbohydrates: acid without gas anaerobically in glucose, fructose, mannose, sorbitol; doubtful in maltose; no acid in inulin (unless it has been heat sterilized), L(+)arabinose, D(+)xylose, mannitol, sucrose.

Litmus milk (7 days). Slight alkalinity, moderate peptonization, sometimes a small clot. Indole -, NH_3 +, MR doubtful, VP -, H_2S doubtful, methylene blue reduction +, nitrate +, nitrite +, catalase +, urease -, phosphatase +, phenylpyruvate -, gluconate -, arylsulphatase -. Hydrolysis of aesculin -, of casein +, of gelatin +, of starch -. Haemolysis +, egg yolk reaction +. Chitinase (zone of clearing in plates of nutrient agar containing 0.5 mg/ml of colloidal chitin, after 7 days) +.

* See Errata - p.157

Psychrophilic strain HB (Sneath, 1956)
(NCTC 9796, ATCC 12473).

Rods with rounded ends, sometimes slightly curved, in young cultures averaging about 1.0 μ in breadth and 3 μ in length, arranged singly or in pairs with occasional chains of 5 - 6 members, showing barred staining and containing scanty fat globules, Gram-negative, not acid fast, no true metachromatic granules, no definite capsule, no heat resistant spores. Motile, possessing a single polar flagellum (of length about 3 μ and wavelength about 2 μ) and in young agar plate cultures in addition several lateral flagella (of length 3 - 5 μ and wavelength about 1.5 μ).

Nutrient agar plate (2 days). Colonies 1 mm in diameter smooth, shiny, round, convex, edge entire, butyrous, whitish or pale violet. Pigmentation commences at the centre and after 5 days the colonies are 4mm in diameter, low convex or low conical, are jelly-like and can often be detached whole from the medium, and are difficult to emulsify. Nonpigmented and non-gelatinous variants are common; plate cultures have a sour smell.

Gelatin plate (20°). After 2 days the colonies are about 0.5 mm in diameter, round, low conical, smooth, with undulant edge, whitish or pale violet. After 7 days there may be softening of the gelatin, and pigmentation is good.

Nutrient agar slope (2 days). Growth is smooth, shiny, slightly raised, usually pale violet, edge entire or lobate. Pigment and gelatinous consistency are well marked after 7 days.

Gelatin stab (20°). Very slight growth along the stab, and a button of surface growth. No liquefaction in 14 days, or only slight softening beneath the growth.

Nutrient broth (2 days). A gelatinous pellicle occasionally forms. The fluid is slightly turbid with slight viscous deposit. After 4-5 days a violet ring forms at the surface which is adherent to the glass, and is thick and gelatinous, with small pale hanging fronds.

* Löffler's serum alone (14 days). Digestion of the medium very slight; pigmentation good.

Potato slope (7 days). A deep violet-brown shiny growth, smooth, undulant, not gelatinous.

The strain has the usual resistance of vegetative organisms to heat and phenol and is penicillin resistant. It grows between 2° and 30°, does not grow anaerobically and grows

* See Errata p. 157

between pH6 and pH9. It grows on 3 per cent NaCl agar but not on 6.5 per cent NaCl agar. Single organisms often do not grow on the surface of agar media and the inhibition is abolished by catalase. It utilises citrate rapidly, but does not utilise malonate. Aerobic cultures produce no detectable hydrogen cyanide. The pigment appears to be identical with that of strain MK.

Peptone water carbohydrates: no definite acidity in any.

Hugh and Leifson medium carbohydrates: acid, but only aerobically, in glucose, fructose, mannose, L(+)arabinose, D(+)xylose, mannitol, sucrose, sorbitol, maltose; not in inulin or salicin.

Litmus milk (7 days). Alkaline, with partial bleaching of the litmus, no peptonization and usually a large clot.

Indole -, BH_3 +, MR -, VP -, H_2S -, Methylene blue reduction weak, nitrate +, nitrite +, catalase +, urease -, phosphatase +, phenylpyruvate -, gluconate +, arylsulphatase -. Hydrolysis of aesculin +, of casein -, of gelatin -, of starch -. Haemolysis -, egg yolk reaction -. Chitinase -.

+See Errata - p. 157

VI. Proposals submitted.

The Judicial Commission is requested to give Opinions on the following proposals:

1. That the generic name Cromobacterium Bergonzini 1879 be placed in the list of nomina generum rejicienda.

2. That the generic name Cromobacterium Bergonzini 1880 be placed in the list of genera conservanda.

3. That the spelling Cromobacterium be recognised as an orthographic variant arising from faulty transliteration of the Greek, and that the accepted spelling be Chromobacterium.

4. That the type species of Chromobacterium be Chromobacterium violaceum Bergonzini 1880, and that this name should be attached to a mesophilic bacterium.

5. That the neotype culture of Chromobacterium violaceum Bergonzini 1880 be the strain MK (NCTC 9757, ATCC 12472).

6. That the neotype culture of Chromobacterium lividum (Eisenberg 1891) Holland 1920 be the strain HB (NCTC 9796, ATCC 12473.

The Commission is also requested to give a ruling on the correct citation of the names of the genus and the type species.

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INTERNATIONAL BULLETIN OF BACTERIOLOGICAL NOMENCLATURE AND TAXONOMY
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NEWS AND NOTES

To Members of the Subcommittee on Neisseriaceae of the Nomenclature Committee of the International Association of Microbiologists

A newsletter:

The Chairman of our group, Professor E.G.D. Murray, has retired from his professorship at McGill University and will devote his time to research at the University of Western Ontario. He will continue as Chairman of our Subcommittee on Neisseriaceae. His address will be 126 Regent Street, London, Ontario, Canada.

Beginning January, 1956, the Secretary of the Subcommittee, Dr. Sara E. Branham, will be succeeded in this office by Dr. Michael J. Pelczar, Department of Bacteriology, University of Maryland, College Park, Maryland. Matters pertaining to the activities of the Committee should be addressed to him after that date. Dr. Branham will continue as a member of the Subcommittee; she has not retired and there is no change in her address. Dr. Branham is checking over her collection of meningococci with the object of establishing type strains representative of the current classification.

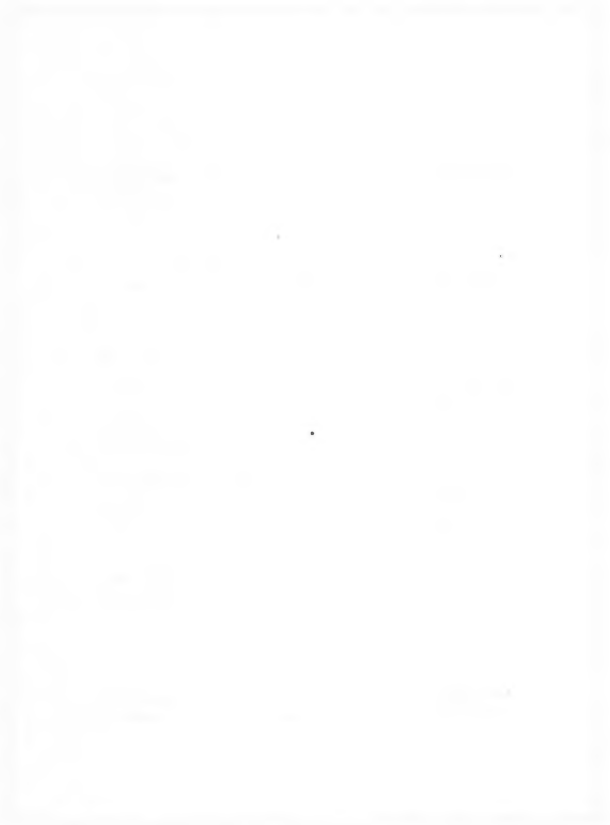
It is with sadness that the Committee notes the death of one of its members, Dr. Th. Thjötta. Dr. Thjötta was an outstanding bacteriologist in this era whose knowledge, experience, and enthusiasm will be sorely missed. A sketch of his life appears in the October 1955 issue of the International Bulletin of Bacteriological Nomenclature and Taxonomy.

Sara E. Branham, Secretary
Subcommittee on Neisseriaceae

To the Members of the Subcommittee on Neisseriaceae

Dr. Sara E. Branham has been Secretary of the Subcommittee on Neiseriaceae from its inception and the acknowledged constructive contribution of the Committee is very largely due to her wise, unselfish and energetic work. Many difficult situations were overcome through her kind and considerate actions and this encouraged the response and contributions made by the members of the Committee.

Dr. Branham has an unequalled knowledge of the Neisseriaceae; so it is fortunate she consents to continue to be a member of the Committee and to establish the Type strains in her collection. Her opinion and guidance will thus continue to be available in what is still an important matter. I am sure I express the feelings of every member of the Committee in thanking Dr. Branham for all she has done.

The Committee is fortunate in the acceptance by Dr. Michael J. Pelczar of the Secretaryship and his success is assured by his interest and active work on Neisseriaceae.

E.G.D. Murray, Chairman
Subcommittee on Neisseriaceae